

AMENDMENTS TO THE DRAWINGS

The attached sheets of drawings include changes to Figure 3d and Figure 11 .

Attachment: Replacement sheets

REMARKS

Favorable reconsideration of the present application in view of the above amendments and following remarks is respectfully requested. Claims 1-54 were pending. The examiner has withdrawn claims 3-7, 24-28 and 41-54 as drawn to non-elected subject matter.

Applicant hereby amends claims 1 and 22 and cancels claims 2, 23, and 51-54 without prejudice to filing a divisional, continuation, or continuation-in-part to the subject matter of these claims. Support for the amendments to claims 1 and 22 can be found throughout the specification as filed, for example, in paragraphs [0023], [0029], [0045] and Figures 3b and 3c. For at least the following reasons, applicant respectfully submits that each of the presently pending claims is in condition for allowance.

Election/Restriction

The examiner has required a restriction of the pending claims to one of the following groups:

- Group I: Claims 1-50 drawn to a microfluidic device
- Group II: Claims 51-54 drawn to a method of making a microfluidic device.

According to the examiner, Group I and II are related as process of making and product made. However, the examiner believes that a restriction is required because the product can allegedly be made by another and materially different process. In particular, the examiner asserts that the product of Group I does not require depositing polysilicone on the substrate and using low-pressure chemical vapor disposition to form the porous membrane.

The examiner has also required a species election if Group I is elected to one of the following species:

- i. Figures 3a-e (drawn to claims 1-2, 8-23, 29-40);
- ii. microfluidic device with both field-force gradient mechanism and molecular trapping mechanism (drawn to claims 3-7, 24-28, 49-50); and
- iii. Figure 3f (drawn to claims 41-48).

applicant has inserted "154" in Figure 3d and has deleted the arrow that had no reference number in Figure 11. Therefore, applicant respectfully requests that these objections be withdrawn.

Specification

The examiner has objected to the specification because it makes reference to Fig. 11a in the Brief Description of the Drawings, while the application contains only Fig. 11, not Fig. 11a. Applicant thanks the examiner for pointing out this inadvertent typographical error. Applicant has hereby amended the specification to recite "Fig. 11" instead of "Fig. 11a." In light of this amendment, applicant believes this objection is rendered moot.

Rejection Under 35 U.S.C. §102(e)

Claims 1-2, 8-10, 12, 15, 19-23, 29-31, 33, and 39-40 stand rejected as allegedly anticipated by US 2006/0124459 ("Strand"). Applicant respectfully traverses the present ground of rejection.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. MPEP 2131. As amended, independent claim 1 is directed to a microfluidic device, comprising:

a source fluid flow channel capable of receiving one or more sample molecules;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane is capable of passing at least one sample molecule from the source fluid flow channel to the target fluid flow channel; and

a field-force/gradient mechanism proximate the porous membrane, wherein the field-force/gradient mechanism comprises an electric field.

As amended, independent claim 22 is directed to a microfluidic molecular-flow fractionator device, comprising:

a substrate, the substrate including:

one or more source fluid flow channels capable of receiving one or more sample molecules;

one or more target fluid flow channels in fluid communication with the one or more source fluid flow channels; and

one or more cross-channel areas at the intersection of each source fluid flow channel and each target fluid flow channel;

a porous membrane positioned in each cross-channel area separating the source fluid flow channels from the target fluid flow channels, wherein the porous membrane is capable of passing at least one sample molecule from the source fluid flow channel to the target fluid flow channel; and

a field-force/gradient mechanism proximate the porous membrane, wherein the field-force/gradient mechanism comprises an electric field.

Applicant submits that Strand does not teach each and every element of independent claims 1 or 22. For example, Strand does not teach or disclose a porous membrane positioned in each cross-channel through which a sample molecule may pass. Paragraph [0112] of Strand teaches that the porous membrane separating the electrolyte channel and the separation chamber must be “conductive for the passage of small ionic species and electrical current” but the “pore size of the membrane is such that all molecules designated as samples will be retained in the sample chamber.” In contrast, the instant claims are directed to microfluidic device with a porous membrane that allows at least one sample molecule to pass through the membrane from the source fluid flow channel to the target fluid flow channel.

In addition, Strand's electrolyte channel is not equivalent to the target fluid flow channel as no sample molecules are allowed to pass into the electrolyte channel. Strand's electrolyte channel is also not a flow channel as presently claimed. The Strand electrolyte channel contains a static well of electrolyte fluid without any flow.

Claims 2-21 depend, directly or indirectly, from claim 1 and therefore include every limitation of claim 1. Claims 23-40 depend, directly or indirectly, from claim 22 and therefore include every limitation of claim 22. For at least the reasons set forth above for claims 1 and 22, applicant submits that Strand also does not anticipate claims 2, 8-10, 12, 15, 19-21, 23, 29-31, 33, and 39-40. Applicant therefore respectfully requests that the present basis for rejection be withdrawn.

Rejections Under 35 U.S.C. §103

Claims 11, 13, 17-18, 32, 34-36 and 38 stand rejected as obvious over Strand in view of U.S. Patent No. 6,248,539 ("Ghardiri"). The examiner acknowledges that Strand does not teach a microfluidic device having a single crystal or polysilicon porous membrane integrally formed on a silicon substrate and further does not explicitly set forth the thickness of the membrane. However, according to the examiner, Ghardiri teaches a microfluidic device having a porous layer or membrane integrally formed on a single crystalline, or amorphous silicon substrate. The examiner also asserts that Ghardiri teaches a membrane between 0.5 to 30 microns.

Claims 14, 16, and 37 stand rejected as obvious over Strand in view of Ghardiri and further in view of U.S. Patent No. 6,806,543 ("Yamakawa"). The examiner acknowledges that neither Strand nor Ghardiri explicitly state the use of a porous membrane made of porous polysilicon and a substrate made of polydimethyl siloxane (PDMS). However, the examiner believes that Yamakawa teaches a microfluidic device having a porous membrane that may be made from a wide variety of materials including single crystal porous silicon (PSi) and porous polysilicon (PPSi).

Applicant respectfully traverses the present bases for rejection. Initially, applicant submits that Yamakawa is not available as prior art against the instant application for the purposes of obviousness. Under 103(c), “[s]ubject matter developed by another person, which qualifies as prior art only under one more more of subsections (e), (f), and (g) of section 102..., shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the claim invention was made, owned by the same person or subject to an obligation of assignment to the same person.” 35 U.S.C. 103(c). Yamakawa qualifies as prior art only under 102(e).¹ Yamakawa and the instant application are both assigned to Intel Corporation as evidenced by the face of U.S. 6,806,543 (Yamakawa) and the face of U.S. Patent Application 2005/0148064 (the instant application). Therefore, the subject matter of Yamakawa and the instant application were, at the time the claimed invention was made, owned by the same person.

As set forth above, Strand does not teach or suggest a porous membrane through which a sample molecule may pass. Ghardiri is directed to semiconductor-based optical interferometric sensors. Ghardiri does not teach or suggest a microfluidic device with a source fluid flow channel and a target fluid flow channel. Ghardiri does not teach or suggest a porous membrane positioned in each cross-channel through which a sample molecule may pass. According to Ghardiri, the index of refraction of the contents of the pores changes when the concentration of analyte species in the pores changes.” The “porous semiconductor layer” of Ghardiri does not appear to allow a sample molecule to pass through the layer. Thus, a combination of Strand and Ghardiri does not make the presently claimed invention obvious. Applicant therefore respectfully requests that the present basis for rejection be withdrawn.

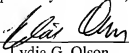
¹ Yamakawa does not qualify as prior art under 102(a) because the invention was not known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent. The statutory language “known or used by others in this country” means knowledge or use which is accessible to the public. MPEP 2132.

In view of the above amendment, applicant believes the pending application is in condition for allowance. The Examiner is invited to contact the applicant's representative at the below-listed telephone number if it is believed that the prosecution of this application may be assisted thereby. Although only certain arguments regarding patentability are set forth herein, there may be other arguments and reasons why the claimed invention is patentable. Applicant reserves the right to raise these arguments in the future.

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Attachments

Respectfully submitted,

By  _____

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